## DESCRIPTION

# LIQUID ACTIVE SUBSTANCE DISPENSER FOR W.C. BOWL

## TECHNICAL FIELD

The present invention relates to a liquid active substance dispenser to be housed within the W.C. bowl, and of the type comprising:

a bottle for containing active substance in the liquid state, and having an exit mouth, and

a support means, separate from the bottle, for supporting said bottle in an inverted position with its mouth facing downwards, in a position subjected to the action of the flushing water flow,

the support means comprising:

an active substance-containing reservoir located in a position subjected to the action of the flushing water flow and arranged to receive the mouth of the bottle,

a closure member for closing the mouth of the bottle,

at least one active substance descent passageway enabling the active substance to descend in a gauged manner into the containing reservoir,

at least one ventilation passage which, when in use, connects the internal chamber of the bottle to the ambient air,

said containing reservoir defining a volume for containing a quantity of active substance which closes said active substance descent passageway.

## BACKGROUND ART

A dispenser having the described characteristics is illustrated in

international patent application PCT/EP02/11765.

The liquid substance contained in the bottle descends through said descent passageway and accumulates in the containing reservoir until it reaches or nearly reaches (but without exceeding it) the maximum level, by which it closes the descent passageway for the active substance.

Using an active substance having a sufficiently high viscosity and a sufficiently small ventilation passageway, the active substance does not emerge from this passageway.

At this point, as its mouth is hermetically closed, a vacuum environment forms in the upper part of the internal chamber of the bottle, which in combination with the external atmospheric pressure and the weight of the substance contained in the bottle, reaches static equilibrium, in which the substance does not emerge from the bottle.

When a flush is activated, the flushing water penetrates into the containing reservoir and carries away in small measures a part of the active substance contained in the reservoir, to dilute it and release its deodorant/ cleansing/refreshing/disinfectant action.

It has been observed experimentally that when a part of the active substance is carried away, this, probably together with the turbulence produced by the flush, causes a little ventilation air to enter the bottle through the ventilation passageway. This changes the equilibrium between the pressure in the bottle and the external pressure, to cause a gauged descent of a measure of active substance, with consequent restoration of the level in the containing reservoir.

A problem present in the dispenser is that a little flushing water remains in the top of the containing reservoir to replace that part of the active

substance R which was carried away; this water which remains in the top of the reservoir is then partly drawn, together with the ventilation air, into the bottle where the pressure is less than that outside; the result is that that as the number of flushes produced by the user increases, the active substance becomes increasingly diluted, until its percentage is excessively low compared with the water, to the point that the positive action of the active substance gradually falls in intensity in an unacceptable manner.

This problem is avoided by providing, in the containing reservoir, at least one drainage aperture of gauged passage size such as to enable water to pass while preventing passage of the active substance.

However this solution is not always effective as its success depends on various physical-chemical values of the substance, on the ambient temperature, on exact constructional dimensions, and on the geometrical form of the W.C. bowl, all factors which it is difficult to control.

An object of the present invention is therefore to improve dispensers of the aforesaid type in such a manner as to solve said problem of dilution of the active substance contained in the bottle by an effective and reliable solution.

## DISCLOSURE OF THE INVENTION

These and further objects are attained by the invention as characterised in the claims.

The invention is described in detail hereinafter with the aid of the accompanying figures, which illustrate one embodiment thereof by way of non-limiting example.

Figure 1 is a section through a first embodiment of the dispenser of the

invention taken on the vertical plane of symmetry I-I of Figure 2

Figure 2 is a top plan view of the support means of Figure 1.

Figure 3 is a section on the plane III-III of Figure 2.

Figure 3A is an enlarged detail of Figure 3.

Figure 4 is a perspective view of the support means of Figure 1, without the bottle.

Figure 5 is a view similar to Figure 3A, showing a second embodiment of the trap-means.

With reference to the first embodiment, shown in Figures 1-4, the dispenser of the invention (indicated overall by 10) comprises a bottle 11 for containing, in its internal chamber, an active substance R of known type in the liquid (more or less viscous) state, able to cleanse and/or deodorize and/or air-refresh and/or disinfect, and provided with an exit mouth 12 for the active substance R.

The dispenser 10 also comprises a support means 20 having a usual hooking means 28, in the form of a hook-shaped elongate element of elastically flexible material, by which it is hooked to the upper rim 8 of a W.C. bowl 7, and able to support said bottle 11 in an inverted position with its axis vertical or nearly vertical and its mouth 12 facing downwards, in a position subjected to the action of the flushing water flow.

The bottle 11 is separate from the support means 20 and is associated with it in order to be located in the W.C. bowl.

The entire dispenser 10, including the bottle 11, is to be housed within the W.C. bowl 7 against its inner surface 71, below its upper rim 8 and exposed to the action of the flushing water flow. Usually, the water flow emerges either along the rim 8 from holes provided in its lower part, or

from a rear central mouth of the bowl and made to flow in a tangential direction along the inner surface 71, below the rim 8.

The support means 20 comprises, for containing the active substance, a reservoir 21 with an upwardly facing concavity, located in a position subjected to the action of the flushing water flow and arranged to receive the mouth 12 of the bottle, and further comprises a closure member 30 positioned in said containing reservoir 21 to close the mouth of the bottle 11.

The containing reservoir 21 comprises a lower base wall 25 having an upper surface, on which the active substance collects, and a substantially vertical side wall 22, which extends upwards from the lower wall 25 and passes through a round angle about the mouth 12 of the bottle to define a volume for containing a quantity of substance. The inner diameter of the side wall 22 is greater than the maximum outer diameter of the exit mouth 12, so that this can be contained within the side wall 22 at a short distance from it.

Preferably, said closure member 30 is in the form of an upwardly facing, substantially cylindrical or slightly frusto-conical tube piece coaxial with the bottle 11, its lower end being joined to the base wall 25 and being closed thereby. The tube piece 30 has an upper end 30' which projects upwards beyond the exit mouth 12 of the bottle when associated with the support means 20, the exit mouth 12 being in geometrical relationship with the tube piece 30 such that its inner surface sealedly embraces the lateral surface of the tube piece 30.

In the illustrated embodiment, with said closure member 30 there is associated a passageway 35 enabling the active substance R to descend

from the internal chamber of the bottle 11 to the containing reservoir 21, the quantity of active substance collected by this latter being such as to close said descent passageway 35.

The descent passageway 35 for the active substance is defined by a gauged vertical corridor formed by a valley provided in the cross-section of the outer lateral surface of the tube piece 30, starting from a point within the chamber of the bottle 11 and terminating below the exit mouth 12 of the bottle 11; said corridor 35 extends along the entire height of the tube piece 30.

The dispenser comprises at least one ventilation passageway 31 which, when in use, connects the internal chamber of the bottle 11 to the ambient air. This ventilation passageway is preferably separate from the descent passageway 35 for the active substance R.

In the illustrated embodiment, the ventilation passageway 31 is defined by a gauged vertical corridor formed by an arched valley provided in the cross-section of the outer lateral surface of the tube piece 30, starting from a point below the exit mouth 12 of the bottle and terminating within the chamber of the bottle 11; said corridor 31 extends along the entire height of the tube piece 30.

The reservoir 21 is arranged to contain a determined maximum level of liquid (indicated by L1 in Figure 3A), and to contain the exit mouth 12 of the bottle 11, with its lower end exit section (indicated by P1 in Figure 3A) positioned below the maximum liquid level L1.

The upper end edge of the side wall 22 determines the maximum level L1 of the liquid which collects within the reservoir 21.

The side wall 22 possesses a number of wall extensions 22b in the form of

crenellations, which project upwards beyond the upper edge of the wall 22 to define a resting means for the body 13 of the bottle 11 in order to position the bottle mouth 12 in a predetermined and precise geometrical relationship with the tube piece 30 and the reservoir 21. The bottle 11 possesses a shoulder 13', from which there projects a cylindrical neck 14 carrying the mouth 12 at its end. The crenellations formed by the extensions 22b surround the mouth 12 and neck 14 of the bottle 11 when in an inverted position, to supportingly receive the shoulder 13' on their upper end edges; when in this position the mouth 12 is inserted into the reservoir 21, with its lower exit section P1 lying at a level less than the maximum level L1.

In detail, the mouth 12 comprises an annular element 12a rigidly fixed to the end of the neck 14, to which there is joined a circular disc 12b for hermetically closing the passage port for the active substance R.

The lower end surface of the element 12a defines the lower end passage section P1. This section P1 lies a small distance from the upper edge of the lateral wall 22 of the reservoir 21, so that a narrow passageway (indicated by F) remains defined for the flushing water towards the concavity of the reservoir 21.

Specifically, the tube piece 30 is cut in an inclined manner to form an upper point which projects upwards by an extent such as to penetrate through the mouth 12 of the bottle when placed in its position of use.

To dispose the bottle 11 in its position of use, it is inserted and pushed manually downwards to cause the tube piece 30 to penetrate into it so that the point of the tube detaches or tears the circular disc 12b away from the annular element 12a, to enable the active substance R present in the

bottle 11 to descend through the exit mouth 12. The support means 20 together with the thus coupled bottle 11 is then placed in the W.C. bowl such that the base wall 25 lies substantially horizontal or nearly so, and the flushing water fed into the W.C. bowl strikes the region in which the reservoir 21 lies.

According to the invention, a siphonic trap-means 40 is provided having an inlet which draws liquid from the containing reservoir 21 at a level L2 lower than the lower outlet section P1 of the bottle mouth and discharges to the outside of the reservoir 21.

The trap-means 40 comprises a vertical conduit 41 joined to the base wall 25 and passing through it, its lower section defining the outlet of the trap-means. Above the vertical conduit 41 there is positioned a cap 42 having its concavity facing downwards to cover the upper mouth 41' of the conduit 41, and its lower edge 42' positioned at a lower level than the upper mouth 41' of the conduit 41. Said lower edge 42' defines the inlet mouth of the trap and is positioned at said level L2 which is lower than the level P1. The upper mouth 41' of the conduit 41 defines instead the triggering level. i.e. the minimum level which the liquid must exceed to trigger the syphon action; said mouth 41' is positioned at a level higher than the level of the lower section P1 of the mouth P1 and also higher than the level L1.

In plan view, the side wall 22 extends as a closed ring which partly passes about the tube piece 30 at a distance therefrom and partly passes about the trap-means 40 at a distance therefrom, so as to enclose both within the containing reservoir 21.

The containing reservoir 21 is enclosed within a collection region 50 arranged to temporarily retain the flushing water until it reaches a level

such as to trigger the action of the trap-means 40, and then to release the water into the W.C. bowl.

Said collection region comprises a horizontal platform 51, which in practice is a prolongation of the base wall 25 and surrounds the collection surface of the reservoir 21, which platform is itself joined to a substantially vertical side wall 52 which surrounds the entire platform 51 and the reservoir 21, at a distance from the lateral wall 22 thereof; the wall 52 is provided with a number of wide apertures 53 for passage of the water, these reaching the level of the platform 51.

The liquid substance R contained in the bottle 11 descends through the (open) mouth 12 and fills the internal closed space of the tube piece 30; this substance flows outwards only through the corridor 35, from which it descends into the reservoir 21 where it accumulates until it reaches the level of the section P1, but without exceeding the maximum level L1.

Using an active substance R having a suitable viscosity (for example 1000-3000x$10^{-2}$ poise), it has been found that if a sufficiently small ventilation passageway 31 is provided, the active substance R does not descend along the passageway 31.

At this point, as the mouth 12 is hermetically closed, a vacuum environment forms in the upper part D of the internal chamber of the bottle 11 above the level of the active substance R, which in combination with the external atmospheric pressure and the weight of the substance contained in the bottle, reaches static equilibrium, without the substance R emerging from the bottle 11.

When a flush is activated, the flushing water runs along the reservoir 21 and carries away with it a small quantity of the substance R contained in

the reservoir 21, to dilute it and release its deodorant/cleansing/ refreshing/disinfectant action into the bowl 7.

The same flush of water temporarily fills the collection region 50 and also the cap 42, to hence trigger the action of the trap-means 40, after which it rapidly leaves through the apertures 53, which are suitably dimensioned to enable the water to drain quickly; however a small amount of water remains within the top of the reservoir 21 to replace that part of the active substance R which has been washed away by the flush. This water lying in the top of the reservoir 21 is quickly drawn out by the action of the trap-means, triggered by the flushing water, which ceases when the liquid level in the reservoir 21 falls to the level L2.

Two important effects are obtained by this. The first effect is that the upper layer of liquid consisting mostly of water is extracted from the reservoir 21, while the lower layer all substantially consisting of active substance is left; this hence avoids or at least considerably reduces the risk of the water of the upper layer being drawn into the bottle interior by the vacuum present therein, which would increasingly dilute the active substance in the bottle interior during use, to a value which would no longer provide an acceptable action.

The inlet level L2 of the trap is set at a distance from the level of the lower section P2 of the mouth such that a large part of the upper layer of liquid formed mostly of water is removed from the reservoir 21, to leave within the reservoir the liquid formed essentially of active substance.

The second effect is that as the level L2 is set slightly lower than the lower section P1 of the mouth, when the liquid in the reservoir 21 reaches this level, the ventilation passage 31 is temporarily freed so that a little

ventilation air enters the bottle 11 through the passageway 31 and reaches the top D of the chamber of the bottle 11. This changes the equilibrium between the pressure in the bottle and the pressure outside the reservoir 21, to cause a gauged descent of the active substance R into the reservoir 21 until, on exceeding the level P1 of the mouth 12, it again closes both the descent paassageway 35 for the substance and the ventilation paassageway 31, with consequent restoration of the level in the reservoir 21. In this respect, the difference between the trap inlet level L2 and the level of the mouth lower section P2 determines the quantity of active substance which is dispensed by the bottle 11 to the reservoir 21, and can therefore be suitably gauged for this purpose.

A still further advantage of the present invention is that as the trap-means 40 extracts the more liquid upper layer from the reservoir 21, this layer is prevented from continuing to drip out of the reservoir 21 and then into the W.C. bowl after the flow of flushing water has ceased, as occurs in dispensers of known type; this dripping is a problem felt in particular when the active liquid is of intense colour and drips onto the inner surface of the bowl to soil it by leaving ugly traces.

In the embodiment shown in Figure 3A, the cap 42 is a piece which is constructed independently of the support means M and possesses a number of radial fins 43 provided in the interior of the cap without hindering water passage, and by which it is fitted to the upper end of the conduit 41 by forcibly mounting the inner edge of the fins 43 over this upper end.

In the embodiment shown in Figure 5, the cap 42 is a piece which is formed in one piece with the bottle 11, to which it is joined by a vertical

web 44, and becomes associated in correct manner with the conduit 41, to define the trap-means 40, when the bottle 11 is fitted in its utilization position to the support means 20.

Numerous modifications of a practical and applicational nature can be made to the invention, but without leaving the scope of the inventive idea as claimed below.